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EXAMINER	
HERNANDEZ, NELSON D	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/071,277	JACOBS, ADAM
	Examiner	Art Unit
	Nelson D. Hernandez	2612

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14 and 22-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,11-14,22,23 and 26-35* is/are rejected.

7)☒ Claim(s) *10,24 and 25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed December 9, 2005 have been fully considered but they are not persuasive.

2. Applicant alleges that the Examiner is using hindsight or the knowledge gained in the present application, to read into the prior art that which is not explicitly pointed out.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). As taught in col. 2, line 66 – col. 3, line 26, by disclosing recording a dark frame by taking a dark image wherein the integration time is kept extremely short so that effectively zero photo-generated charge is accumulated, Merrill teaches that the dark current is less than the offset signal, since there is not enough time to accumulate dark current.

3. Applicants cites col. 4, lines 39-46 "Because of the fast shutter capability, it is possible to perform these calibration image measurements even without darkening the image on the sensor array. These calibration images are not the same as prior art techniques that integrate a dark current over a time interval--those techniques can also

be used, to further remove leakage or dark current artifacts, but they require actually darkening the image on the sensor array" and argues that "the invention in Merrill is different from the application is different from prior art attempts to deal with dark current; that in Merrill the light is never shut off, so the light current is (probably) always greater than his dark current and that Merrill does not mention or suggest measuring for a time t_s".

The Examiner agrees that the invention in Merrill is different form the application, however, the Examiner understands that Merrill teaches measuring those measurements as a different way from the prior art (without having to dark the image in the sensor array) as cited in col. 4, lines 39-46. Also by teaching exposing the images sensor for a very short period of time (See col. 3, lines 3-25), Merrill teaches measuring for a predetermined time t_S.

4. Applicant argues that "Thomas suggest measuring the dark current during the time the image is being transferred, not during the time the array is receiving the image".

Examiner disagrees, by teaching capturing both, the image and the dark image at the same time (Col. 2, line 64-col. 3, line 67), Thomas teaches measuring dark current at the same time the array is receiving the image, since the process of measuring dark current starts at the time the image sensor is receiving image signal, which is the same time the dark current is also received by the optical dark region.

Therefore the rejections on claims

Claim Objections

5. **Claim 23** objected to because of the following informalities:

Claim 23 recites "the dark current signals of step c) are produced from an unilluminated first CMOS image array, and further comprising: recording signals $S_d = G_1(f_1(T,\tau))$ which result of step e)". Seems that the dark current signals should be from step b) instead of c). Also recites that the signals $S_d = G_1(f_1(T,\tau))$ result from step e). In step e), seem that the signal would be $S_1 = G_1(f_1(T,\tau) + k_1 I_1 R_1 QE_1)$ since the exposure time is long enough that dark current signals are not small compared to $O_{1'}$, if that is the case, then the projected light produced signals would not be small compared to $O_{1'}$ either. For examining purposes, the dark current signals will be read as from step b) and the signal $S_d = G_1(f_1(T,\tau))$ will also be read as result from step b). Appropriate correction is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 1, 4, 5, 13, 14, 22, 23, 26-30, 32 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merrill, US Patent 6,452,633 B1 in view of Thomas, US Patent 6,525,769 B1.**

Regarding claim 1, Merrill discloses an apparatus, comprising: a monolithic device (Fig. 3) comprising: a first CMOS imaging array (Col. 8, lines 60-65; col. 13, lines 47-54); and a means for recording signals O_1, the offset signals O_1 recorded by exposing the first CMOS image array for a time t_s, where t_s is a short enough time that dark current signals and projected light produced signals are small compared to offset signals in pixels of the first CMOS array (Col. 2, line 66 – col. 3, line 26 and col. 13, lines 4-54). By disclosing recording a dark frame by taking a dark image wherein the integration time is kept extremely short so that effectively zero photo-generated charge $G_1(k_1 I_1 R_1 QE_1)$ is accumulated, since the signal S would not include any photo-generated signal: $S_1 = G_1(f_1(T,\tau) + k_1 I_1 R_1 QE_1) + O_{1'} = G_1(f_1(T,\tau)) + O_{1'}$ (See col. 2, line 66 – col. 3, line 50; col. 4, lines 22-46; col. 6, lines 45-52; col. 7, lines 21-36; col. 8, lines 60-65; col. 13, lines 4-67); although Merrill is silent to specify that the dark current is small compared to offset signals in pixels of the first CMOS array, examiner understands that the dark current signals $G_1(f_1(T,\tau)$ are directly proportional to the exposure time, so by making an extremely short integration time when capturing a dark frame, the dark current would be negligible when compared to the offset signal; $\lim_{\tau \to 0} S_1 = \lim_{\tau \to 0} G_1(f_1(T,\tau)) + O_{1'} = O_{1'}$, therefore the signal will substantially include offset signal only, $O_{1'} = S_1$.

Merrill fails to teach a dark current monitoring device integrated with the first CMOS imaging array, the dark current monitoring device monitoring the dark current during the time that the first CMOS imaging array is received an image.

However, Thomas teaches an apparatus (Fig. 1: 100) for compensating dark current in an imaging device (Fig. 1: 102 and 2: 102), said sensor comprising a light shield (Fig. 2: 110) on a part of the image sensor for capturing signal related only to the dark current and storing said signal to perform dark current compensation to the captured image at the time the image is being captured (Col. 2, line 64 – col. 3, line 67; col. 4, line 1 – col. 5, line 51).

Therefore, taking the combined teaching of Merrill in view of Thomas as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Merrill having a light shield on a part of the image sensor for capturing signal related only to the dark current and storing said signal to perform dark current compensation to the captured image at the time the image is being captured. The motivation to do so would have been to perform accurate reduction of dark current errors in the image device as suggested by Thomas (Col. 2, lines 1-31).

Regarding claim 4, the combined teaching of Merrill in view of Thomas as applied to claim 1 teaches that the dark current monitoring device is at least one semiconductor light sensor integrated with the monolithic device having means attached to the monolithic device to prevent light from activating the semiconductor light sensor (See Thomas, col. 2, line 64 – col. 3, line 67; col. 4, line 1 – col. 5, line 51). Grounds for rejecting claim 1, apply here.

Regarding claim 5, the combined teaching of Merrill in view of Thomas as applied to claim 1 teaches multiple semiconductor light sensors are used to determine dark current variation over the monolithic device (In Thomas, the shield is covering a

plurality of pixel sensors in two areas of the semiconductor image sensor, col. 2, line 64 – col. 3, line 67; col. 4, line 1 – col. 5, line 51). Grounds for rejecting claim 1, apply here.

Regarding claim 13, the combined teaching of Merrill in view of Thomas as applied to claim 1 teaches a stored record of dark current from each pixel of the first CMOS image array, measured previous to the time that the CMOS image array receiving the image; associated circuitry using the stored record and the monitored dark current to correct the output of each pixel of the first CMOS image array receiving the image. Grounds for rejecting claim 1 apply here.

Regarding claim 14, the combined teaching of Merrill in view of Thomas as applied to claim 1 does not teach that the stored record and the associated circuitry using the stored record are integrated with the monolithic device. However, Official Notice is taken that integrating different circuitry related to the imaging device in the same substrate is notoriously well known in the art and would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the monolithic device by having the stored record and the associated circuitry using the stored record integrated with the monolithic device. The motivation to do so would have been to reduce size and cost of fabrication of the monolithic device.

Regarding claim 22, Merrill discloses a method of recording an image of an object using light reflected or transilluminated from the object, comprising; forming an image of the object on a first CMOS image array (Fig. 3) by projecting the light reflected or transilluminated from the object on to the first CMOS image array, the first CMOS

image array formed on a monolithic semiconductor substrate (Col. 8, lines 60-65; col. 13, lines 47-54; and exposing the first CMOS image array for a time t_S, where t_S is a short enough time that dark current and projected light produce signals small compared to offset signals in pixels of the first CMOS array (Col. 2, line 66 – col. 3, line 26 and col. 13, lines 4-54). By disclosing recording a dark frame by taking a dark image wherein the integration time is kept extremely short so that effectively zero photo-generated charge $G_1(k_1 I_1 R_1 QE_1)$ is accumulated, since the signal S would not include any photo-generated signal: $S_1 = G_1(f_1(T,\tau) + k_1 I_1 R_1 QE_1) + O_{1'} = G_1(f_1(T,\tau)) + O_{1'}$ (See col. 2, line 66 – col. 3, line 50; col. 4, lines 22-46; col. 6, lines 45-52; col. 7, lines 21-36; col. 8, lines 60-65; col. 13, lines 4-67); although Merrill is silent to specify that the dark current is small compared to offset signals in pixels of the first CMOS array, examiner understands that the dark current signals $G_1(f_1(T,\tau)$ are directly proportional to the exposure time, so by making an extremely short integration time when capturing a dark frame, the dark current would be negligible when compared to the offset signal; $\lim_{\tau \to 0} S_1 = \lim_{\tau \to 0} G_1(f_1(T,\tau)) + O_{1'} = O_{1'}$, therefore the signal will substantially include offset signal only, $O_{1'} = S_1$.; and then recording signals O_1 measured as a result of exposure for time t_S (Col. 2, line 66 – col. 3, line 26 and col. 13, lines 4-54); and then subtracting O_1 from signals produced by the first CMOS image array when exposure times are long enough that dark current signals are not small compared with $O_{1'}$ (Col. 2, line 66 – col. 3, line 26 and col. 13, lines 4-54).

Merrill does not explicitly disclose the step of monitoring the dark current of the first CMOS image array with at least one dark current monitoring device integrated with

the first CMOS imaging array on the monolithic semiconductor substrate, the monitoring of the dark current concurrent with the forming of the image.

However, Thomas teaches an apparatus (Fig. 1: 100) for compensating dark current in an imaging device (Fig. 1: 102 and 2: 102), said sensor comprising a light shield (Fig. 2: 110) on a part of the image sensor for capturing signal related only to the dark current and storing said signal to perform dark current compensation to the captured image at the time the image is being captured (Col. 2, line 64 – col. 3, line 67; col. 4, line 1 – col. 5, line 51).

Therefore, taking the combined teaching of Merrill in view of Thomas as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Merrill having a light shield on a part of the image sensor for monitoring signal related only to the dark current and storing said signal to perform dark current compensation to the captured image at the time the image is being captured. The motivation to do so would have been to perform accurate reduction of dark current errors in the image device as suggested by Thomas (Col. 2, lines 1-31).

Regarding claim 23, the combined teaching of Merrill in view of Thomas as applied to claim 22, teaches that the dark current are produced from an unilluminated first CMOS image array, and further comprising: recording signals $S_1 = G_1(f_1(T,\tau))$ (After monitoring the dark current in the image array as taught in Thomas). Grounds for rejecting claim 22 apply here.

Regarding claim 26, Merrill discloses a system, comprising: a monolithic device, the monolithic device comprising a first CMOS imaging array (Fig. 3); and a means for

recording signals O_1, the offset signals O_1 recorded by exposing the first CMOS image array for a time t_s, where t_s is a short enough time that dark current signals and projected light produced signals are small compared to offset signals in pixels of the first CMOS array (Col. 2, line 66 – col. 3, line 26 and col. 13, lines 4-54). By disclosing recording a dark frame by taking a dark image wherein the integration time is kept extremely short so that effectively zero photo-generated charge $G_1(k_1 I_1 R_1 QE_1)$ is accumulated, since the signal S would not include any photo-generated signal: $S_1 = G_1(f_1(T,\tau) + k_1 I_1 R_1 QE_1) + O_{1'} = G_1(f_1(T,\tau)) + O_{1'}$ (See col. 2, line 66 – col. 3, line 50; col. 4, lines 22-46; col. 6, lines 45-52; col. 7, lines 21-36; col. 8, lines 60-65; col. 13, lines 4-67); although Merrill is silent to specify that the dark current is small compared to offset signals in pixels of the first CMOS array, examiner understands that the dark current signals $G_1(f_1(T,\tau)$ are directly proportional to the exposure time, so by making an extremely short integration time when capturing a dark frame, the dark current would be negligible when compared to the offset signal; $\lim_{\tau \to 0} S_1 = \lim_{\tau \to 0} G_1(f_1(T,\tau)) + O_{1'} = O_{1'}$, therefore the signal will substantially include offset signal only, $O_{1'} = S_1$; an optical system for imaging light reflected or transilluminated from an object on to the first CMOS imaging array (Merril inherently discloses an optical system by teaching that the system is for an electronic camera (Col. 6, lines 30-43)).

Merrill does not explicitly disclose a dark current monitoring device integrated with the first CMOS imaging array, the dark current monitoring device monitoring dark current concurrently with the recording of an image by the first CMOS imaging array and

circuitry for correcting the output from the first monolithic CMOS image array to account for the dark current monitored by the dark current monitoring device.

However, Thomas teaches an apparatus (Fig. 1: 100) for compensating dark current in an imaging device (Fig. 1: 102 and 2: 102), said sensor comprising a light shield (Fig. 2: 110) on a part of the image sensor for capturing signal related only to the dark current and storing said signal to perform dark current compensation to the captured image at the time the image is being captured (Col. 2, line 64 – col. 3, line 67; col. 4, line 1 – col. 5, line 51).

Therefore, taking the combined teaching of Merrill in view of Thomas as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Merrill having a light shield on a part of the image sensor for monitoring signal related only to the dark current and storing said signal to perform dark current compensation to the captured image at the time the image is being captured. The motivation to do so would have been to perform accurate reduction of dark current errors in the image device as suggested by Thomas (Col. 2, lines 1-31).

Regarding claim 27, the combined teaching of Merrill in view of Thomas as applied to claim 26 teaches a storage device for storing the corrected output (The systems in Merrill and Thomas are to be used in an electronic camera, which inherently indicates that the corrected signal will be stored in a storage device). Grounds for rejecting claim 26 apply here.

Regarding claim 28, the combined teaching of Merrill in view of Thomas as applied to claim 26 does not teach a display device for displaying the corrected output.

However, Official Notice is taken that the use of display devices in electronic cameras is notoriously well known in the art and it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a display device to display the corrected image data with the motivation of enabling the user to observe the processed image data.

Regarding claim 29, the combined teaching of Merrill in view of Thomas teaches the same as in claim 26. Grounds for rejecting claim 26 apply here.

Regarding claim 30, the combined teaching of Merrill in view of Thomas teaches the same as in claim 22. Grounds for rejecting claim 22 apply here.

Regarding claim 32, the combined teaching of Merrill in view of Thomas teaches the same as in claim 22. Grounds for rejecting claim 22 apply here.

Regarding claim 35, the combined teaching of Merrill in view of Thomas teaches the same as in claim 22 (See multiple light shields in fig. 2: 110 for monitoring dark current at a plurality of locations). Grounds for rejecting claim 22 apply here.

8. **Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merrill, US Patent 6,452,633 B1 in view of Thomas, US Patent 6,525,769 B1 and further in view of Bozso, US Patent 6,756,651 B2.**

Regarding claim 2, the combined teaching of Merrill in view of Thomas as applied to claim 1 does not teach that the monolithic device consists of a single semiconductor chip comprising a silicon substrate with integrated circuitry integrated with a surface of the silicon substrate.

However, the use of monolithic devices consists of a single semiconductor chip comprising a silicon substrate with integrated circuitry integrated with a surface of the silicon substrate is well known in the art and taught by Bozso (Col. 1, line 45 – col. 2, line 59; col. 3, line 43 – col. 4, line; col. 6, lines 52-58) with the purpose of minimizing dark current in the imaging device.

Therefore, taking the combined teaching of Merrill in view of Thomas and further in view of Bozso as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the monolithic device by using a silicon substrate for the substrate of the monolithic device. The motivation to do so would have been to minimize dark current in the imaging device as suggested by Bozso (Col. 1, line 45 – col. 2, line 59; col. 3, line 43 – col. 4, line; col. 6, lines 52-58).

Regarding claim 3, the combined teaching of Merrill in view of Thomas as applied to claim 1 does not teach that the monolithic device consists of a single semiconductor chip comprising a substrate with integrated circuitry integrated with a surface of the substrate comprising silicon germanium material.

However, the use of monolithic devices consisting of a single semiconductor chip comprising a substrate with integrated circuitry integrated with a surface of the substrate comprising silicon germanium material is well known in the art and taught by Bozso (Col. 1, line 45 – col. 2, line 59; col. 3, line 43 – col. 4, line; col. 6, lines 52-58) with the purpose of minimizing dark current in the imaging device.

Therefore, taking the combined teaching of Merrill in view of Thomas and further in view of Bozso as a whole, it would have been obvious to one of ordinary skill in the art

art at the time the invention was made to modify the monolithic device by using a silicon germanium substrate for the substrate of the monolithic device. The motivation to do so would have been to minimize dark current in the imaging device as suggested by Bozso (Col. 1, line 45 – col. 2, line 59; col. 3, line 43 – col. 4, line; col. 6, lines 52-58).

9. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merrill, US Patent 6,452,633 B1 in view of Thomas, US Patent 6,525,769 B1 and further in view of Kurosawa, US Patent 6,667,468 B2.

Regarding claim 6 and 7, the combined teaching of Merrill in view of Thomas as applied to claim 1 does not teach that the at least one semiconductor light sensor is a second CMOS imaging array.

However, the use of a separate image sensor for monitoring dark current is well known in the art as taught by Kurosawa, wherein teaches an image sensor comprising a first pixel array area (Fig. 2: 201) and a second pixel array area (Fig. 2: 204) covered by a light shield so as to monitor the dark current in the image device in order to correct the image signal produced by the first pixel array area (Col. 2, lines 1-64).

Therefore, taking the combined teaching of Merrill in view of Thomas and further in view of Kurosawa as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the monolithic device by having one or more imaging arrays with light shields for monitoring the dark current present in the image sensor. The motivation to do so would have been to correct the image signal produced by the first pixel array area as suggested by Kurosawa (Col. 2, lines 1-64).

10. Claims 8, 12 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merrill, US Patent 6,452,633 B1 in view of Thomas, US Patent 6,525,769 B1 and further in view of Sato, US Patent 6,798,456 B1.

Regarding claim 8, the combined teaching of Merrill in view of Thomas as applied to claim 1 does not teach that the dark current monitoring device comprises: at least one temperature monitoring device for monitoring temperature of the monolithic device, and; associated circuitry to determine dark current from the monitored temperature.

However, Sato teaches an electronic still camera (Fig. 1), comprising an image sensor (Fig. 1: 33), wherein said image sensor comprises a thermo sensor (Fig. 1: 60) adhered to the opposite side of the image sensor to monitor the temperature on said image sensor so as to perform dark current correction based on the detected temperature (Col. 2, lines 34-63; col. 3, lines 4, lines 13-45; col. 5, lines 3-20).

Therefore, taking the combined teaching of Merrill in view of Thomas and further in view of Sato as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the monolithic device by having a thermo sensor to monitor the temperature on the image sensor so as to perform dark current correction based on the detected temperature. The motivation to do so would have been to perform dark current compensation based on the detected temperature on the image sensor as suggested by Sato (Col. 5, lines 3-20).

Regarding claim 12, the combined teaching of Merrill in view of Thomas and further in view of Sato as applied to claim 8, teaches that the associated circuitry is

integrated with the monolithic device to determine dark current from the monitored temperature (See Sato, col. 2, lines 34-63; col. 3, lines 4, lines 13-45; col. 5, lines 3-20). Grounds for rejecting claim 8 apply here.

Regarding claim 33, the combined teaching of Merrill in view of Thomas as applied to claim 22 does not teach that the step of monitoring the dark current comprises: monitoring the temperature of the first monolithic CMOS imaging array with at least one temperature monitoring device integrated with the first monolithic CMOS imaging array; and calculating the dark current from the monitored temperature.

However, Sato teaches an electronic still camera (Fig. 1), comprising an image sensor (Fig. 1: 33), wherein said image sensor comprises a thermo sensor (Fig. 1: 60) adhered to the opposite side of the image sensor to monitor the temperature on said image sensor so as to perform dark current correction based on the detected temperature (Col. 2, lines 34-63; col. 3, lines 4, lines 13-45; col. 5, lines 3-20).

Therefore, taking the combined teaching of Merrill in view of Thomas and further in view of Sato as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the monolithic device by having a thermo sensor to monitor the temperature on the image sensor so as to perform dark current correction based on the detected temperature. The motivation to do so would have been to perform dark current compensation based on the detected temperature on the image sensor as suggested by Sato (Col. 5, lines 3-20).

11. Claims 9, 11 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merrill, US Patent 6,452,633 B1 and Thomas, US Patent

6,525,769 B1 in view of Sato, US Patent 6,798,456 B1 and further in view of Miyaguchi, US Patent 5,508,740.

Regarding claim 9, the combined teaching of Merrill in view of Thomas and further in view of Sato as applied to claim 8 does not teach that multiple temperature monitoring devices are used to determine dark current variation over the monolithic device.

However, Miyaguchi teaches an imaging device (Fig. 8) comprising a plurality of temperature monitoring devices (Fig. 8: 150) to determine dark current variation over the monolithic device based on the temperature detected on said plurality of temperature monitoring devices, wherein said temperature monitoring device works by determining the voltage drop across a P-N diode junction having a constant current (See fig. 5; col. 5, lines 39-48) (Col. 1, lines 35-54; col. 2, lines 34-65; col. 4, lines 27-39; col. 5, lines 24-47; col. 7, lines 17-52).

Therefore, taking the combined teaching of Merrill and Thomas in view of Sato and further in view of Miyaguchi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the monolithic device by having a plurality of temperature monitoring devices to determine dark current variation over the monolithic device based on the temperature detected on said plurality of temperature monitoring devices. The motivation to do so would have been to perform dark current signal correction on the monolithic device based on the temperature detected on said plurality of temperature monitoring devices located in different areas of the image sensor.

Regarding claim 11, the combined teaching of Merrill and Thomas in view of Sato and further in view of Miyaguchi teaches the same as in claim 9. Therefore, grounds for rejecting claim 9 apply here.

Regarding claim 34, the combined teaching of Merrill in view of Thomas and further in view of Sato as applied to claim 22 does not teach that the step of monitoring temperature comprises: monitoring the temperature at a plurality of locations on the monolithic semiconductor substrate; and calculating the temperature variation over the first CMOS image array during the forming of the image.

However, Miyaguchi teaches an imaging device (Fig. 8) comprising a plurality of temperature monitoring devices (Fig. 8: 150) to determine dark current variation over the monolithic device based on the temperature detected on said plurality of temperature monitoring devices, wherein said temperature monitoring device works by determining the voltage drop across a P-N diode junction having a constant current (See fig. 5; col. 5, lines 39-48) (Col. 1, lines 35-54; col. 2, lines 34-65; col. 4, lines 27-39; col. 5, lines 24-47; col. 7, lines 17-52).

Therefore, taking the combined teaching of Merrill and Thomas in view of Sato and further in view of Miyaguchi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the monolithic device by having a plurality of temperature monitoring devices to determine dark current variation over the monolithic device based on the temperature detected on said plurality of temperature monitoring devices. The motivation to do so would have been to perform dark current signal correction on the monolithic device based on the

temperature detected on said plurality of temperature monitoring devices located in different areas of the image sensor.

12. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Merrill, US Patent 6,452,633 B1 in view of Thomas, US Patent 6,525,769 B1 and further in view of Corum, US Patent 6,101,287.

Regarding claim 31, the combined teaching of Merrill in view of Thomas as applied to claim 22 teaches recording an output of the at least one dark current monitoring device and the dark current output from each pixel of the unilluminated first CMOS image array; calculating the dark current contribution at each pixel during the forming of the image on the basis of the dark current concurrently with forming the image; and subtracting the dark current monitored contribution at each pixel from the output of the first monolithic CMOS image array (See grounds for rejecting claim 22) but does not teaches that the step of recording an output of the at least one dark current monitoring device and the dark current output from each pixel of the unilluminated first CMOS image array is performed in a different step than the step of forming the image.

However, Corum teaches a method of correcting dark current on an image array wherein the step of capturing the image is perform in a different step than capturing the dark current to later subtract said dark current signal from the image signal (Col. 2, line 31 – col. 3, line 24).

Therefore, taking the combined teaching of Merrill in view of Thomas and further in view of Corum as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device by capturing the image is

perform in a different step than capturing the dark current to later subtract said dark current signal from the image signal. The motivation to do so would have been to perform compensation to the dark current based on a better estimation of dark current as suggested by Corum (Col. 2, lines 5-12).

Allowable Subject Matter

13. **Claims 10, 24 and 25** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 10, the main reason for indication of allowable subject matter is because the prior art fails to teach or reasonably suggest that the temperature-monitoring device is a PTAT circuit with the monolithic device in combination with the limitations of claims 1 and 8.

Regarding claim 24, the main reason for indication of allowable subject matter is because the prior art fails to teach or reasonably suggest that recording an effective gain coefficient $G_i^* = G_1(k_i I_i QE_i)$ in combination with the limitations of claims 22 and 23.

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nelson D. Hernandez whose telephone number is (571) 272-7311. The examiner can normally be reached on 8:30 A.M. to 6:00 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Ometz can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

TUAN HO
PRIMARY EXAMINER

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Nelson D. Hernandez
Examiner
Art Unit 2612

NDHH
February 16, 2006

TUAN HO
PRIMARY EXAMINER